Appendix II, Document 5: Soil Sampling Protocol for Soil Organic Matter Analysis

WHAT DO I NEED?

Be sure to bring materials with you when heading to the field for soil sampling.

As shown in Figure 1, these materials include:

1. Two buckets (one for sample and one for supplies)
2. Soil sample bags: one-gallon freezer storage bags (or soil sample bags); one bag per sample
3. One clipboard and papers for recording
4. Permanent marker and/or pen
5. A soil probe or straight shovel (sharpshooter or drain spade style).
6. Ice pack(s) (**optional**, needed for hot days when samples for nitrogen content or biological properties.)

Figure 1. Materials needed for soil sampling

WHERE TO SAMPLE?

A. Determine the number of samples to be taken from each field (or APN).

Decide whether one sample will adequately represent the field (or APN), or whether an APN should be split to into multiple sampling units. A field is not the same and may vary in soil type, fertility, or cropping and management histories. Divide the field into different sampling units and make sure conditions inside the same sampling unit are as uniform as possible. If a uniform field is very large, you may need to divide it into several sampling units so as each sampling unit is no larger than 20 acres. One soil sample is needed from each unit.

B. Inside a sampling unit, a composite soil sample is taken.

1. Identify locations within the unit where soil samples are representative.
2. Borders and irregular areas should be avoided, unless a sample is specifically being collected from those areas to identify constraints.
3. As shown in Figure 2, one soil core from each location. Total 14 cores will be taken mixed in the bucket to make a composite soil sample to represent the sampling unit.

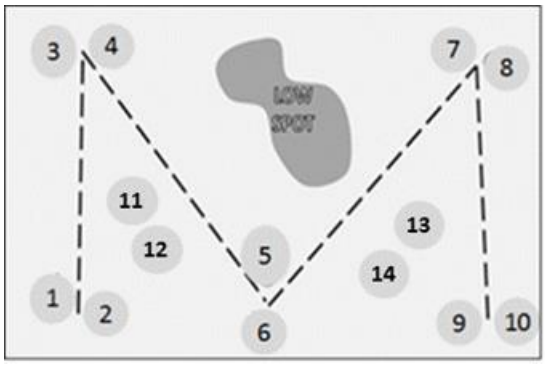

Figure 2. Locations where samples should be taken within a sampling unit

4. For a sampling unit, about 10 -20 locations should be selected to make a composite sample.

HOW TO TAKE A COMPOSITE SOIL SAMPLE?

A. Two important requirements must be met when taking soil samples:

1. A uniform slice of soil from the soil surface to a desired depth must be taken.
2. The same volume of soil must be collected from each sample location.

B. Depth to sample:

Depth to take soil samples is usually determined by the crop, what you are interested to know, and your knowledge about the soil profile. For soil organic matter content for the purpose of the 2017 CDFA Healthy Soils Program, sampling depth should be from surface to 8" deep.

C. How to take sample with a soil probe (Figure 3)

1. Remove surface debris (A).
2. Push probe steady and straight to the desired depth (e.g., 8" in a tomato field) (B).
3. Remove the core and place it in the clean bucket.
4. Go to the next location and repeat steps 1-3.
5. Finish sampling from all (ten or more) locations.
6. Gently mix soils in the bucket and collect them in the sample bag labeled with the APN, sampling date, and farm name (C).

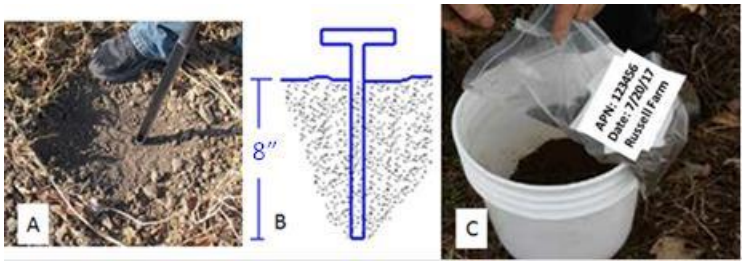

Figure 3. Taking samples with a soil probe.

D. How to take samples with a shovel or spade (Figure 4)

1. Remove surface debris (A).
2. Use the spade to dig a small hole about 8'' deep. From the side of the hole, **take a vertical, rectangular slice of soil 8" deep and about 2" thick** (B).
3. Remove any extra soil to ensure that the sample is the same width at the top and bottom of the slice. It is important to collect the same amount of soil through the 6" sample profile so that it is not biased with more soil from the surface compared to the subsurface (C).
4. Place sample into a clean bucket.
5. Go to the next location and repeat the steps 1-4 for all locations.
6. Gently mix soils in the bucket and collect 6 cups of well-mixed soils (or no less than 1 lb.) into the sample bag labeled with the APN, sampling date, and farm name (D).

Figure 4. Taking samples with a shovel.

SAMPLE STORAGE AND SHIPPING TO A SOIL TESTING LABORATORY

Before you send your soil samples for analysis, ensure that the laboratory uses University of California test methods, which are test methods proven on California farms by the University. Contact the soil testing laboratory where you plan to send your samples.

CDFA recommends the laboratories listed at the following websites for tests conducted for the 2017 Healthy Soils Program:

- Selected Plant and Soil Laboratories in Northern and Central California: http://cesonoma.ucanr.edu/files/27431.pdf.
- UC Cooperative Extension el Dorado County List of Laboratories for Tissue/Soil/Water – Agricultural Analysis: http://cecentralsierra.ucanr.org/files/115331.pdf.
- UC ANR Soils Testing Laboratories for Home Gardeners: http://ccmg.ucanr.edu/files/51308.pdf.
- Selected Plant and Soil Testing Laboratories in Central and Southern California: http://ceventura.ucanr.edu/Com_Ag/Subtropical/Avocado_Handbook/Resources/Plant_Disease_Diagnostics_and_Soil_Testing_Labs_in_California-1999_/

Please check with the laboratory where you intend to send samples to ensure if there are specific requirements regarding sample storage, packing and shipping. Requirements may be different depending on what soil properties are to be tested. Provided below are general guidelines regarding handling of soil samples:

- Ship your soil samples to a soil test laboratory as soon as possible.
- Ensure all sample bags are correctly labeled and sealed.
- Provide a soil sampling form together with samples in the shipping box.
- For tests on soil texture, organic matter content, pH, cation exchange capacity or mineral contents other than nitrogen, samples can be handled at room temperature.
- For tests on nitrogen content and/or biological properties (e.g. microorganisms), keep samples out of direct sunlight and store as cool as possible (ice packs recommended) during sampling and storage. Store samples in a refrigerator or cold room after returning from the field. Pack soil samples with ice packs when shipping.
- Contact the soil testing laboratory a few days after samples are shipped to check they were received and are being handled properly.

SOIL HEALTH DATA

A. Required by CDFA

The cost of the following test are covered by the 2017 CDFA HSP Incentives Program funds in Project Years 1 and 2 and by matching funds provided by awardees in Project Year 3.

- Soil organic matter content.

B. Optional data, encouraged but not required by CDFA

The costs of the following tests are to be covered by matching funds provided by awardees

during the full project term (i.e. 3 years).

Physical properties:

- Bulk density
- Surface hardness
- Subsurface hardness)
- Water infiltration
- Water holding capacity
- Aggregate stability
- Saturated hydraulic conductivity

Chemical Properties

- pH
- Soil chemical composition

Biological properties

- Active or labile carbon
- Soil protein
- Soil respiration
- Earthworm

REFERENCES

- Moebois-Clune B.N., D.J. Moebois-Clune, B.K. Gugino, O.J. Idowu, R.R. Schindelbeck, A.J. Ristow, H.M. van Es, J.E. Thies, H.A. Shayler, M.B. McBride, D.W. Wolfe, and G.S. Abawi. 2016. Soil sampling protocol. In Comprehensive Assessment of Soil Health. Soil and Crop Science Section, Cornell University. Ithaca, NY. P. 27-30.
- USDA NRCS. 2007. Soil sampling for nutrient management. https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=nrcs144p2_051273&ext=pdf
- UCCE UC Small Farm Program, 2017. Soil sampling. http://sfp.ucdavis.edu/pubs/Family_Farm_Series/Veg/Fertilizing/soil/